

What is claimed is:

1. A light-filtering element for a display device, comprising:
at least one filter having a chamber with a filtering fluid, the filtering fluid selectively disposed in an optical path; and
5 a liquid motion actuator selectively configured to move the filtering fluid substantially into and out of the optical path.
2. The light-filtering element of claim 1, wherein the liquid motion actuator includes a bubble generator configured to selectively produce a vapor
10 bubble within the chamber to displace the filtering fluid from the optical path.
3. The light-filtering element of claim 2, wherein the bubble generator includes at least one resistor selectively activated to effect formation of the vapor bubble.
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4. The light-filtering element of claim 2, wherein the vapor bubble is configured to reflect light in the optical path.
5. The light-filtering element of claim 2, wherein the bubble generator
20 is configured to selectively generate bubbles which intermittently reflect light in the optical path to affect intensity of light passing through the filtering chamber.
6. The light-filtering element of claim 1, wherein the liquid motion actuator includes a piezo-element.
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7. The light-filtering element of claim 1, wherein the liquid motion actuator is configured to alter the surface characteristics of the chamber.
8. The light-filtering element of claim 1, wherein the filtering fluid is a
30 colored fluid.

9. A color-generating device, comprising:

a plurality of color elements disposed in an optical path, wherein each color element includes at least one filter having a chamber with a filtering fluid, the filtering fluid being selectively disposed in the optical path; and

5 a liquid motion actuator configured to selectively move the filtering fluid into and out of the optical path.

10. The color-generating device of claim 9, wherein the liquid motion actuator includes a bubble generator configured to selectively produce a vapor bubble within the chamber to displace the filtering fluid from the optical path.

11. The color-generating device of claim 10, wherein the bubble generator includes at least one resistor selectively activated to effect formation of the vapor bubble.

12. The color-generating device of claim 10, wherein the vapor bubble is configured to reflect light in the optical path.

13. The color-generating device of claim 10, wherein the bubble generator is configured to selectively generate bubbles which intermittently reflect light in the optical path determine the intensity of light passing through the filtering chamber.

14. The color-generating device of claim 9, wherein the liquid motion actuator includes an electrically-actuated element configured to alter the dimensions of the chamber.

15. The color-generating device of claim 9, wherein the liquid motion actuator includes a piezo-element.

16. The color-generating device of claim 14, wherein the chamber includes a surface treatment adapted to promote a flow of fluid out of the optical path when the piezo-element is not actuated.

5 17. A display system, comprising:

an illumination source configured to produce light and direct light along an optical path;

a color generator disposed in the optical path, the color generator comprising one or more color elements, where one or more color elements has at least one filter with a color-filtering fluid and an associated liquid motion actuator, the filter being selectively configurable in at least one of a filtering state and a non-filtering state; and

a display surface configured to receive light from the color generator to produce a color image.

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18. The display system of claim 17, wherein the at least one filter has a transparent region disposed in the optical pathway, and where the color-filtering fluid is selectively positionable substantially within the transparent region when the filter is in a filtering state.

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19. The display system of claim 17, wherein the at least one filter has a transparent region disposed in the optical pathway and where the color-filtering fluid is selectively positionable substantially outside the transparent region when the filter is in the non-filtering state.

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20. The display system of claim 17, wherein the liquid motion actuator is a bubble generator configured to selectively generate a bubble in the optical path to reflect light such that the filter is in a non-filtering state.

21. The display system of claim 20, wherein the bubble generator includes a selectively-actuated resistor to control generation of the bubble.

22. The display system of claim 20, wherein each color element
5 includes a red filter with red-filtering fluid, a green filter with green-filtering fluid, and a blue filter with a blue-filtering fluid, each filter being separately configurable in a filtering state and a non-filtering state to produce different colored light.

23. A color element for a display system having a light source, the color
10 element comprising:

a plurality of chambers, each chamber containing a filtering fluid; and

a piezo-element coupled with each chamber, the piezo-element being selectively deformable to move the filtering fluid between a region of the chamber outside a light path into a region of the chamber within the light path.

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24. The color element of claim 23, wherein the plurality of chambers are layered such that they are overlapping in the light path.

25. The color element of claim 24, wherein the plurality of chambers
20 includes a first chamber with cyan fluid, a second chamber with yellow fluid, and a third chamber with magenta fluid to enable the color element to produce different colors.

26. The color element of claim 23, wherein the chamber includes a
25 surface treatment adapted to promote a flow of fluid out of the select region where the piezo-element is not deformed.

27. The color element of claim 23, wherein the region of the chamber within the light path is hydrophobic.

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28. The color element of claim 23, wherein the region of the chamber outside the light path is hydrophilic.

29. A method of filtering light, the method comprising:
5 directing light along an optical path onto a filter, the filter having filtering fluid moveable into and out of the optical path;
selectively moving the filtering fluid within the filter; and
directing light through the filter.

10 30. The method of claim 29, wherein selectively moving the filtering fluid within the filter includes selectively moving the filtering fluid substantially into the optical path, and directing light through the filter includes passing light through the filtering fluid to produce filtered light.

15 31. The method of claim 29, wherein selectively moving the filtering fluid includes selectively generating a bubble within the optical path, thereby displacing the filtering fluid to outside the optical path.

20 32. The method of claim 31, wherein directing light through the filter includes reflecting light off the bubble in the optical path.

33. The method of claim 31, wherein selectively generating a bubble within the optical path includes actuating a resistor coupled to the filter.

25 34. The method of claim 29, wherein selectively moving the filtering fluid includes selectively actuating at least one piezo-element.

30 35. The method of claim 34, wherein selectively actuating at least one piezo-element includes deforming the filter to force the filtering fluid into the optical path.

36. The method of claim 35, wherein directing the light through the filter includes passing the light through the filtering fluid to produce a color.

37. A color generator for a display system having an optical path, the
5 color generator comprising:

a first color filter within the optical path having a first color filtering fluid selectively adapted to filter impinging light;

a second color filter within the optical path having a second color filtering fluid selectively adapted to filter impinging light;

10 a third color filter within the optical path having a third color filtering fluid selectively adapted to filter impinging light;

a first promotion means linked to the first color filter to promote motion of the first color filtering fluid into and out of the optical path;

15 a second promotion means linked to the second color filter to promote motion of the second color filtering fluid into and out of the optical path; and

a third promotion means linked to the third color filter to promote motion of the third color filtering fluid into and out of the optical path.

38. The color generator of claim 37, wherein the first color filter, second
20 color filter and third color filter are substantially adjacent within a color element and the first promotion means, second promotion means, and third promotion means are individually controlled to produce a selected color output.

39. The color generator of claim 38, wherein the first color filtering fluid
25 is red liquid, the second color filtering fluid is green liquid, and the third color filtering fluid is blue liquid.

40. The color generator of claim 37, wherein the first color filter, second color filter and third color filter are overlapped within a color element to allow light to pass through each filter sequentially and where the first promotion means, second promotion means, and third promotion means are individually controlled
5 to produce a selected color output.

41. The color generator of claim 40, wherein the first color filtering fluid is cyan liquid, the second color filtering fluid is magenta liquid, and the third color filtering fluid is yellow liquid.